

1. A receiver for a code division multiple access system comprising:

a frequency offset estimating section which
15 carries out in-phase adding operations to said pilot
symbols of said complex vector expression over a
predetermined interval in accordance with a
predetermined pattern, carries out a complex adding
operation of results of said in-phase adding
20 operations, and determines a frequency offset from a
result of said complex adding operation; and

2. The receiver according to claim 1, wherein said

predetermined interval is an interval longer than one symbol period.

3. The receiver according to claim 1, wherein said pilot symbol producing section orthogonally demodulates said RF signal into an in-phase component and an orthogonal component, and produces a channel count data indicative of a number of effective channels from said in-phase component and said orthogonal component based on a spreading code, a symbol rate and a pilot symbol interval, and

wherein said receiver further comprises:

10 a control unit which generates an addition count data indicative of the number of pilot symbols to be added and an in-phase summing pattern, and

wherein said frequency off set estimating section determines said predetermined interval and
15 said predetermined pattern based on said addition count data and said in-phase summing pattern.

4. The receiver according to claim 1, wherein said frequency off set estimating section includes:

an in-phase adding section which carries out said in-phase adding operations to said pilot symbols
5 of said complex vector expression over said predetermined interval in accordance with said predetermined pattern;

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10 said in-phase adding operations; and

said complex adding operation.

phase adding units, each of which includes:

5 of said complex vector expression;

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10 pattern; and
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of said complex vector expression.

addition synthesizing section includes:

a complex adder which carries out said complex

5 adding operations.

7. The receiver according to claim 4, wherein said frequency offset estimating unit includes:

a buffer memory which stores said result of
said complex adding operation;

5 a conjugate complex multiplier which carries
out a conjugate complex multiplication of said result
of said complex adding operation stored in said buffer
memory to calculate phase difference vectors;

an averaging unit which carries out an

10 averaging operation to said phase difference vectors;

an angle converter which converts said averaged
phase difference vector to an angle value; and

a converter which converts said angle value to said frequency offset based on a symbol rate.

8. A method of automatically controlling a frequency in a code division multiple access system comprising:

producing pilot symbols of complex vector
5 expression from a received radio frequency (RF) signal
based on a first local frequency signal and a second
local frequency signal, wherein said first local
frequency signal has a frequency obtained by shifting
a frequency of a carrier signal by an IF frequency and

determining a frequency offset from said pilot
15 symbols of said complex vector expression through in-
phase adding operations to said pilot symbols of said
complex vector expression over a predetermined
interval based on a predetermined pattern; and

9. The method according to claim 8, wherein said predetermined interval is an interval longer than one symbol period.

orthogonally demodulating said RF signal into
an in-phase component and an orthogonal component; and

10 wherein said method further comprises:
generating said addition count data indicative

generating said predetermined interval and said predetermined pattern based on an addition count data indicative of a number of pilot symbols to be added

10 reading out said pilot symbols of said complex
vector expression from said buffer based on over said
predetermined interval and said predetermined pattern,
to carry out said in-phase adding operation to said
read out pilot symbols of said complex vector
15 expression.

carrying out said complex adding operation of the results of said in-phase adding operations.

storing said result of said complex adding
operation in a buffer memory;

5 carrying out a conjugate complex multiplication
of said result of said complex adding operation stored
in said buffer memory to calculate phase difference
vectors;

carrying out an averaging operation to said

10 phase difference vectors;

converting said averaged phase difference
vector to an angle value; and

converting said angle value to said frequency
offset based on a symbol rate.

5 for transmission and in which a variable transmission
symbol rate is realized by making a spreading rate
variable under a constant chip rate, comprising:

15 estimating a frequency offset based on a result
of conjugate complex multiplication of a plurality of
said complex vector expressions which are subjected to
the in-phase addition.

controlling an oscillation frequency of a
crystal oscillator in accordance with an estimation of
the frequency offset calculated through the estimation
of the frequency offset;

converting the received frequency signal into
an intermediate frequency signal in accordance with

the oscillation frequency; and

- 10 orthogonally demodulating the intermediate
frequency signal based on the oscillation frequency.

17. An automatic frequency controlling method
according to claim 15, further comprising:

- obtaining a baseband signal having an in-phase
component and an orthogonal component through the
5 orthogonal modulation and converting into digital
signals by A/D converters, respectively;

 inversely spreading the digital signals by
inversely spreading units to separate the pilot
symbols from the data symbols; and

- 10 converting the pilot symbols into complex
vector expressions by canceling the data modulated
components of the pilot signals.

18. An automatic frequency controlling system in a
code division multiple access system using a spectrum
spreading technique which has a frame format in which
pilot symbols and data symbols are time multiplexed
5 for transmission and in which a variable transmission
symbol rate is realized by making a spreading rate
variable under a constant chip rate, comprising:

- an orthogonal demodulator converting a received
signal into a baseband signal having an in-phase
10 component and an orthogonal component;

an estimating section estimating the frequency
offset from conjugate complex multiplication of a
25 plurality of said complex vector expressions which are
subjected to the in-phase summation.

10 the estimating section estimating the frequency

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15  band signal;
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20

5

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wherein the intermediate frequency signal is
orthogonally demodulated using the oscillation

21. A CDMA receiver in a code division multiple access system using a spectrum spreading technique which has a frame format in which pilot symbols and data symbols are time multiplexed for transmission and in which a variable transmission symbol rate is realized by making a spreading rate variable under a constant chip rate, comprising:

10 a first local frequency generator supplying the
mixer with a local oscillation signal;

an orthogonal demodulator for orthogonally demodulating the intermediate frequency signal in accordance with a second local frequency of a second
15 local frequency generator;

inversely spreading units converting in-phase components and orthogonal components of the baseband signal received from the orthogonal demodulator into analog/digital signals;

10 pilot symbol demodulators separating the
15 inversely spread signal outputted from the inversely
20 spreading units into pilot symbols and data symbols,
25 and converting the pilot symbols into complex vector
expressions by canceling the data modulated components
of the pilot symbols;

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30 section;
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35 summation; and

40 generators.